

## CLAIMS

### WE CLAIM AS OUR INVENTION:

1. A method of detecting and correcting bit errors in a digitally encoded data stream comprising:
  - correlating a received bit transition in the data stream with a plurality of possible bit transitions to generate a corresponding plurality of correlated bit transition values;
  - 5 generating a bit transition decision for the received bit transition corresponding to a greatest correlated bit transition value;
  - comparing consecutive bit transition decisions to identify bit transition decision errors;
  - determining if a respective bit transition decision is consistent with a prior  
10 adjacent bit transition decision in the data stream; and
  - substituting, for each bit transition decision for which a bit transition decision error is determined, the next greatest correlated bit transition decision.
- 15 2. The method of claim 1, further comprising disregarding a bit transition if the greatest correlation value and the next greatest correlation value for the bit transition are equal.
3. The method of claim 1, further comprising disregarding a bit transition if two of more correlated bit transition values are equal.
- 20 4. The method of claim 1, further comprising disregarding a bit transition if the greatest correlation value and the next greatest correlation value for the bit transition are inconsistent with the corresponding prior adjacent bit transition.
5. The method of claim 1, wherein correlating a received bit transition further comprises:
  - performing a Fourier transform on each bit transition to generate a frequency domain representation of the bit transition;

convolving the frequency domain representation of the bit transition with each of a plurality of frequency domain representations of possible bit transitions to generate respective convolution responses; and

performing an inverse Fourier transform on the respective convolution responses  
5 to generate respective bit transition correlation values corresponding to each of the possible bit transitions.

6. The method of claim 1, wherein an encoding format of the data stream is selected from the group comprising a GMSK, an MSK, a PSK, a QPSK, a M-ary PSK, and an FSK format.

10 7. A method of detecting and correcting bit errors in a digital communication system comprising:

correlating a received bit transition with a plurality of possible bit transitions to create a plurality of correlation values corresponding to each of the possible bit transitions; and

15 generating a bit transition decision for the received bit transition corresponding to a greatest correlated bit transition value.

8. The method of claim 7, further comprising comparing consecutive bit transition decisions to identify bit transition decision errors.

9. The method of claim 8, further comprising:  
20 determining if a respective bit transition decision is consistent with a prior adjacent bit transition decision in the data stream; and

substituting, for each bit transition decision for which a bit transition decision error is determined, the next greatest correlated bit transition decision.

10. A method of detecting and correcting bit errors in a digital communication  
25 system comprising:

acquiring a plurality of bit transition samples from a digital data stream;  
correlating each of the bit transitions samples with a plurality of possible bit transitions to create a corresponding plurality of correlated bit transition values;

generating, for each bit transition sample, a bit transition decision corresponding to a greatest correlated bit transition value from the plurality of correlated bit transition values;

5 determining, for each bit transition sample, a bit transition decision corresponding to a second largest correlated bit transition value from the plurality of correlated bit transition values;

subtracting, for each bit transition sample, the largest correlated bit transition value from the second largest correlated bit transition value to determine a bit transition decision distance value;

10 assigning, for each bit transition sample, a first bit transition decision corresponding to the bit transition having the largest correlated bit transition value;

assigning, for each bit transition sample, a second bit transition decision corresponding to the bit transition having the second largest correlated bit transition value;

15 determining, for each bit transition sample, if the first bit transition decision is consistent with a prior adjacent bit transition decision in the digital data stream; and

if the first bit transition decision is inconsistent with the prior adjacent bit transition decision, replacing the first bit transition decision with the second bit transition decision.

20 comparing consecutive bit transition decisions to identify bit transition decision errors;

determining if a respective bit transition decision is consistent with a prior adjacent bit transition decision in the data stream; and

25 substituting, for each first bit transition decision for which a bit transition decision error is determined, the second bit transition decision.

11. The method of claim 10, wherein correlating each of the bit transitions samples comprises convolving the bit transition sample with each of the plurality of possible bit transitions.

12. The method of claim 10, wherein the plurality of possible bit transitions comprises waveforms corresponding to a 00 bit transition, a 01 bit transition, a 10 bit transition, and a 11 bit transition.

13. The method of claim 10, wherein determining if the first bit transition decision is consistent with a prior adjacent bit transition decision further comprises:

determining if a prior adjacent bit transition decision of the form "x0" is followed by a first bit transition of the form "0x;" and

5 determining if a prior adjacent bit transition decision of the form "x1" is followed by a first bit transition of the form "1x."